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Magnetic properties of Dy 3+ ions and crystal field characterization in YF 3:Dy 3+and DyF 3 single crystals

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Abstract

The de magnetic susceptibilities of the orthorhombic DyF 3 single crystals have been measured in the temperature range between 1.8 and 300 K. The susceptibility along the b-axis does not depend on temperature below T C =2.55 K and is equal to the demagnetizing factor of the sample, that gives evidence for the ferromagnetic phase induced by the magnetic dipole-dipole interactions between the Dy 3+ ions. The saturation moment of 8.5 μ B/Dy 3+ along the b-axis was determined from magnetization measurements. The observed strong anisotropy of the magnetic susceptibility at low temperatures agrees with the measured anisotropic g-tensor of the ground state of impurity Dy 3+ ions in YF 3 single crystals. The results of measurements are interpreted in the frameworks of the crystal field theory and the mean magnetic field approximation.

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